C-5 VEGETATED BUFFERS

PURPOSE & APPLICATIONS

A vegetated buffer strip is a constructed or natural strip or area of vegetation for removing sediment, organic matter and other pollutants from runoff. Its purpose is to use the vegetation to remove sediment and other pollutants from runoff by filtration, infiltration, absorption, adsorption, decomposition, and volatilization. In addition to filtering sediment, vegetated buffers of well-developed native vegetation also provide shade, coarse woody debris, nutrient uptake and numerous other benefits to water bodies.

This practice applies to land undergoing development where buffers are needed to reduce sediment damage to adjacent property. Buffer strips shall only be used to remove sediment from overland (sheet) flow. Buffers are not effective in removing sediment from concentrated flows. Vegetated buffers are especially valuable as a "polishing" step from sedimentation traps and basins where a suspended silt and clay material is a problem.

CONSIDERATIONS

- Buffer is effective only as long as the flow through the filter is shallow sheet flow.
- Vegetative buffers cannot be expected to remove all sediments or adequately protect adjacent areas from sediment damage. Vegetative filters should only be considered as one component of the erosion and sediment control system. The effectiveness of buffers can vary considerably depending on the type of vegetation, the height and density of the vegetation, season of the year, type of sediment (sand, silt or clay), the size of the area exposed, and the topography of the exposed area.
- It is always preferable to use existing vegetation rather than replanting. Existing vegetation should be well developed, preferably composed of a suitable density of woody shrubs and tree stems of a range of sizes, age classes and species, and an intact forest floor. Naturally occurring coarse woody debris adds surface roughness, increasing water residence time and infiltration, and should not be removed or otherwise disturbed.
- Vegetative buffers shall be planned and established prior to disturbing the land that will produce the sediment.
- There are not precise design criteria that will guarantee a particular level of sediment removal.
- Careful plant selection can improve wildlife habitat for food and nesting.

Restabilization of a Disturbed Area

Disturbed areas may be stabilized in many different ways. Most commonly, a permanent cover of grasses and legumes is established. There are locations, however, where other types of vegetation are preferred. The following situations are examples of ways in which trees, shrubs, vines, and ground covers may be used:

- Protecting or re-establishing native forest cover is highly preferred in buffer areas of adequate width adjacent to surface water bodies.
- On cut and fill slopes adjacent to paved areas of shopping centers, schools, industrial parks, or other non-residential projects to control erosion.
- Where ornamentals are desirable for landscaping purposes.
- To reduce or eliminate the need for mowing and maintenance, especially in problem areas (shade, steep slopes, inaccessible places).
- In areas where pedestrian movement should be limited.
- Where woody plants are desirable for soil conservation or to establish wildlife habitat.
- Along streambanks to provide shading and leaf litter for fish habitat and as a buffer from runoff filled with sediment and nutrients.

SPECIFICATIONS

In unorganized areas, contact the Land Use Regulation Commission (LURC) directly for information about widths of buffers that apply in unorganized areas.

Construction of Grassed Filter Strips

Grassed filter strips can be built below areas where sedimentation can be expected during construction. They should be built and stabilized very early in the construction sequence to be sure they are functional.

A critical factor to determine for an effective buffer strip is the required width. Effective buffer strip widths may vary from only a few feet in relatively well drained flat areas to as much as several hundred feet in steeper areas with more impermeable soils.

Amount and rate of runoff that will pass through the strip is determined by:

- Land use and treatment above the strip.
- Slope of land above the strip.
- Length of slope above the strip.
- Erodibility of soil above the strip.

Physical properties of the filter strip itself are determined by:

- Slope of the land in the strip.
- Type of vegetation.
- Degree of maintenance the buffer will receive.

Installation Requirements

The minimum width of the buffer strip shall be 25 feet **or** in accordance with local CEO or DEP regulations.

The width of the buffer shall be increased proportionately for slopes longer than 150 feet or for higher sediment concentrations. When using filter strips at inlets to storm sewers, as large an area as possible should be provided to ensure it will function as intended. Buffers should be placed along the contours whenever possible. No construction shall be allowed within buffer strip areas.

Vegetation must be adapted to sediment-producing areas. Both existing and established vegetation must be healthy and have a vigorous growth habit. Establishing vegetation by seed shall be done in accordance with the measures for PERMANENT VEGETATION BMPs.

Using Natural Vegetated Filter Strips

Trees, shrubs, natural forest litter, debris, and the organic duff layer must be protected for this function. Ideally, vegetation should be well developed, preferably composed of a suitable density of woody shrubs and tree stems of a range of sizes, age classes and species, and an intact forest floor. Naturally occurring coarse woody debris adds surface roughness, increasing water residence time and infiltration, and should not be removed or otherwise disturbed.

Forest Management: Any timber harvesting in a Natural Vegetated Filter Strip in the past ten years should have retained a healthy stand of trees and shrubs, regenerated new seedlings of native species, and minimized disturbance of the forest floor. Active forest management of Natural Vegetated Filter Strips may occur without impairing their function as long as Forestry Best Management Practices developed by the Maine Forest Service in 2003 are observed. Consult Maine Forest Service for additional information.

Natural Resources Protection Act

DEP regulations require that an undisturbed strip of vegetation be maintained adjacent to wetlands and waterbodies (including both intermittent and perennial streams). For more information about this law, contact the DEP Bureau of Land and Water Quality.

Phosphorus Control in Lake Watersheds

Refer to the DEP publication "Phosphorus Control in Lake Watersheds: A Technical Guide to Evaluating New Development" for information about this subject.

Wildlife Buffers

The Department of Inland Fisheries and Wildlife recommends the following natural vegetated buffers for wildlife protection along streams and wetlands:

- **Minimum width of undisturbed vegetation:** 100 feet on either side of stream/wetland (200-foot corridor total width).
- **Width of zone of minimum disturbance:** 150 feet additional on either side of stream/wetland (500-foot corridor total width).

The zone of minimum disturbance can be managed for forestry production with IF&W guidelines. The recommended width will vary with the value of the stream or wetland. Consult IF&W to determine the appropriate width and refer to the IF&W publication and maps "Significant Fish and Wildlife Resources of Maine."

Plant Selection

There are many plants that may be used for buffers; however native species of plants should be selected as they are best adapted to Maine climate, they are fairly easy to grow, and are commonly available from commercial nurseries. Information on such plants can be obtained from nurserymen, landscape architects, the Natural Resources Conservation Service (NRCS) and the University of Maine Cooperative Extension Service. Ideally, emphasis should not be merely on selection of a single appropriate species, but on re-establishing native forest vegetation assemblages and structures, including a natural forest floor. Further assistance on plant selection, planting, health and care is available from the Maine Forest Service.

Trees: Selection of trees depends on the desired function of the tree, whether it is shade, privacy screening, noise screening, appearance, and enhancement of wildlife habitat. The following characteristics of the tree should be considered when making choices:

- "Hardiness Zones" are based on average annual minimum temperature.
- The eventual height of a tree must be considered in relation to its planting location to avoid future problems with power lines and buildings.
- Some trees attain mature height at an early age, others take many years. If "instant shade" is desired, rapid growth is needed. Slow-growing trees are usually less brittle and live longer.
- Some trees obstruct underground pipelines with fibrous roots.
- Maintenance problems can be avoided by not selecting trees that drop seedpods, flowers, or twigs in large amounts. On the other hand, these same species may provide exceptional sources of food for wildlife.
- If good soil and drainage are not available, trees tolerant of poor growing conditions must be planted.
- If a tree is unusually attractive in appearance, some other shortcomings may be overlooked.
- Evergreens are useful for privacy screens and noise screens. Deciduous trees are preferable for shade trees in the summer and allow light to filter through in the winter.
- Some trees provide excellent food and nesting areas for wildlife. Tall shade trees on the southern side of streambanks provide shading necessary for Maine fisheries.
- Consider the prior use of the land; adverse soil conditions, such as poor drainage or acidity; exposure to wind; temperature extremes; location of utilities, paved areas, and security lighting; and traffic patterns.
- Spring is the preferred planting season for deciduous trees (hardwoods) and early fall (August-September) for evergreens. Trees to be planted as bare-rooted seedlings should be handled only while dormant in the spring, or after leaf fall in autumn.
- Dig generous sized planting holes with perpendicular sides. Loosen the soil at the bottom of the hole. Set trees and shrubs at the same level as they were at the nursery. Spread the roots out and work soil over and around them. Alternate the soil with layers of peat or compost until the hole is nearly full, compacting the soil firmly with your foot around the roots. Fill the hole with water. Finally, fill the hole with loose dirt, shaping a shallow basin to retain water. Support newly planted trees as needed to prevent excessive swaying. Stakes or guy wires may be used
- Wait until the second year when feeder roots are established to fertilize bare rootstock.
- Soil around the tree should be thoroughly watered after the tree is set in place and when the soil becomes dry. Mulching around the base of the tree (use bark mulch since straw or hay may attract mice) is helpful in preventing roots from drying out.

Shrubs: Much of what has been said about trees also applies to shrubs. A shrub is an erect woody plant less than 15 feet tall, usually with several trunks rising from a common base. Some have the appearance of small trees, and some lie close to the ground.

Vines and Ground Covers

Low growing plants that sprawl, trail, spread, or send out runners. Some are suitable only as part of a maintained landscape, and some can stabilize large areas with little care.

Forest Protection

Often it is necessary to protect desirable wooded areas and individual trees from injury during construction. The purpose is to ensure the survival of desirable trees where they will be effective for erosion and sediment control, watershed protection, landscape beautification, dust and pollution control, noise reduction, shade and other environmental benefits while the land is being developed

Selecting Trees to be Retained: The proper development of a wooded site requires completion of a plan for tree preservation before clearing and construction begins. Trees should be identified by species and located on a topographical map, either as stands or as individuals, depending on the density and value of the trees.

Life expectancy and present age: Preference should be given to long-lived tree species, such as white pine, red or white oak, beech, sugar maple and other species. Older trees that may be excessively stressed by construction should be assessed by a qualified arborist or forester. Retaining such trees while allowing natural regeneration of younger individuals is preferable, since older trees may provide greater environmental and aesthetic benefits. However, if preservation of individual trees is likely to cause unsafe conditions during or after construction, replacement with new trees may be considered.

Health: Individual trees and groups of trees should be evaluated by a qualified arborist or forester for signs of stress, disease, loss of vigor or structural defect. Safety or environmental risks should be evaluated in relation to the setting and present or potential environmental or aesthetic benefits. Indicators of potentially hazardous conditions may include fire or lightning scars, insect or disease damage, obvious rot or damage, overhanging limbs and crown vigor. Species considerations may include crown shape, size at maturity, shade or moisture tolerance and rooting habit. Land use history of the site may influence tree characteristics. Maintenance of tree/forest vigor may require thinning, pruning or other treatments. Contact the Maine Forest Service for additional assistance.

Wildlife: Preference should be given to trees that provide food, cover, and nesting sites for birds and game.

Survival needs of the tree: Chosen trees must have enough room to develop naturally. They will be subject to injury from increased exposure to sunlight, heat radiated from buildings and pavement, and wind. It is best to retain groups of trees rather than individuals. As trees mature, they can be thinned gradually.

Relationship to other trees: Individual species should be evaluated in relation to other species on the site. Species diversity of wooded areas should be maintained. Individual species should be retained unless warranted by natural stand development patterns (e.g. elimination of gray birch, popple or similar early successional species). Trees standing alone generally have higher landscape value than those in a wooded situation. However, tree groups are much more effective in preventing erosion and excess stormwater runoff.

Protection During Construction

If lot size allows, select trees to be saved before siting the building. No tree should be destroyed or altered until the design of buildings and utility systems is final.

Critical areas, such as flood plains, streambanks, lake and pond shore, steep slopes, and wetlands, should be left in their natural condition or only partially developed as open space. Locate roadways to cause the least damage to valuable stands. Follow original contours, where feasible, to minimize cuts and fills.

Plan Identification: Groups of trees and individual trees selected for retention should be accurately located on the plan and designated as "tree(s) to be saved." Individual specimens that are not part of a tree group should also have their species and diameter noted on the plan.
Clearing Limits: The limits of clearing should be located outside the drip line of any tree to be retained, preferably at a minimum of 15 ft from the trunk, and in no case closer than five feet to the trunk of such a tree.
Tree Marking: Marking individual trees and stands of trees to be retained within the limits of clearing should be visibly marked with a bright-colored surveyor's ribbon or flagging applied in a band circling the tree at a height visible to equipment operators.
Equipment Operation and Storage: Heavy equipment travel, storage or stockpiles of any construction materials including topsoil should not be permitted within the drip line of any tree to be retained (or a minimum of 15 ft form the trunk of the tree). Heavy equipment operating over tree roots will probably kill a tree (even though it may take a few years to die). A five-foot minimum should only be used in the case of protecting an existing or recently cut tree line near the edge of the construction zone where equipment will be limited to only one side of the trees which will dramatically increase the survival rate.
Storage and Disposal of Toxic Materials: No toxic materials should be stored within 100 feet of the drip line of any trees to be retained. All construction debris, including paint, acid, nails, gypsum board, wire, chemicals, fuels and lubricants, must be properly disposed of.
Fencing: Any device may be used which will effectively protect the roots, trunk and tips of trees retained on the site. However, trees to be retained within 40 feet of a proposed building or earth moving activities should be protected by fencing. Fencing should be highly visible, of sturdy construction and at least 3 feet high. Fences may be snow fence, board fencing, synthetic fabric fence, plastic fence or similar materials. Additional trees may be left standing as protection between the trunks to be retained and the limits of clearing. To be effective, the trunks of the trees in the buffer must be no more than six feet apart to prevent passage of equipment and material through the buffer. These additional trees should be re-examined prior to the completion of construction and either given sufficient treatment to ensure survival or removed.
Trunk Armoring: As a last resort, a tree trunk can be armored with burlap wrapping and 2-inch studs wired vertically no more than two inches apart to a height of five feet encircling the trunk. The root zone within the drip line will still require protection with this alternative. Nothing should ever be nailed to a tree. Fencing and armoring devices should be in place before any earthwork activity is begun, kept in good repair for the duration of construction activities, and be the last items removed during the final cleanup, upon the project's completion.

Raising the Grade: When the ground level must be raised around an existing tree or tree group, a well should be created slightly beyond the drip line of the tree(s) to retain the natural soil in the area of the feeder roots. In the case of an individual tree, when the above alternative is not practical or desirable, a dry well can be constructed around the trunk with space to allow for trunk growth. Drainage within the well and around the root system inside the drip line should be provided.

Lowering the Grade: Trees should be protected from harmful grade cuts by the construction of a tree wall. Tree walls should be located outside the drip line of any tree to be retained and in no case, closer than 5 feet to the tree trunk. Following excavation, all tree roots that are exposed and/or damaged should be trimmed cleanly, painted with tree wound dressing (if desirable) and covered with moist peat moss, burlap or other suitable material to keep them from drying out. The wall should be constructed of large stones, brick, building tile, concrete block, or cinder block. If drainage through the wall is necessary, install tile drains or perforated PVC pipes.

Trenching and Tunneling: To reduce the amount of root area damaged or killed by trenching activities, excavate as far away as possible from the crown drip line. The ends of damaged and cut roots should be cut off smoothly and may be protected by painting with a tree wound dressing.

Cleanup: The time that follows completion of a construction project can be critical for trees. Trees protected throughout the development operation are often destroyed by carelessness during the final cleanup and landscaping. Fences and barriers should be removed after everything else is cleaned up and carried away.

MAINTENANCE

Buffers: Inspect buffers regularly for signs of erosion and channelization of water. Repair them as needed to promote sheet flow conditions.

During Construction: Even with precautions, some damage to protected trees may occur. In such cases, the following maintenance guidelines should be followed.

Mulching: Disturbed soil between trees and shrubs must be mulched or planted with permanent vegetation to prevent erosion. Refer to the MULCHING BMP or the PERMANENT VEGETATION BMP to select a method for stabilizing these areas.

Soil Aeration: If the soil has become compacted over the root zone of any tree, the ground should be aerated by punching small holes in it with suitable aerating equipment.

Repair of Damage: Any damage to the crown, trunk or root system of any tree retained on the site should be repaired immediately. Damaged roots should immediately be cut off cleanly inside the exposed or damaged area. Cut surfaces may be allowed to air dry.

All tree limbs damaged during construction or removed for any other reason should be cut off above the collar at the preceding branch junction. Larger limbs will require 3 cuts to safely remove the damaged limb without damaging the trunk.

Maintenance of Trees: Like all plants, trees require water and fertilizer to grow. Ideally, young trees should receive an inch of water each week for the first two years after planting. When rain does not supply this need, the tree should be watered deeply but not more often than once per week.

Transplanted trees should be fertilized one year or so after planting. There are many sophisticated ways to supply fertilizer to trees, but some simple methods are adequate. The best material for small trees is well-rotted stable manure, if it can be obtained. Add it as a 2-inch layer of mulch around the tree annually.

Maintenance of Shrubs: Proper pruning, water, and application of fertilizer every three years or so will keep shrubs healthy. Maintain the mulch cover or turf cover surrounding the shrubs. A heavy layer of mulch reduces weeds and retains moisture.

Maintenance of Vines: Trim old growth as needed to improve the appearance of ground covers. Most covers need once-a-year trimming to promote growth. Maintain mulch cover with additions of mulch where needed. Fertilize as described above every 3-4 years.